

## A STUDY OF BIOLOGICAL RESPONSES OF DIFFERENT DURATION MOBILE PHONE FREQUENCY EXPOSURE ON SEMINAL FLUID BIOCHEMISTRY OF MEN

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### **ABSTRACT**

*For this seminal fluid of 273 human subjects (110 non-users of mobile phone and 163 different duration mobile phone users) of 19-45 years of age group were analyzed manually as per WHO (2003) protocol. Results indicated a highly significant ( $p < 0.001$ ) increased in acid phosphatase activity while ( $p < 0.001$ ) increased the level of alkaline phosphatase activity in seminal fluid of mobile phone users (using more than 5-10 years) in comparison to non-users were observed. Such findings might be an indication of adverse biological responses of mobile phone frequency on human reproduction and reproductive system which makes human population infertile and creates another risk factor for various pathological conditions (like cancer). A further standardized study is needed to assess the risk of mobile phone use on the reproductive system.*

**KEYWORDS:** Mobile Phone, Seminal Fluid, Acid Phosphatase Activity, Alkaline Phosphatase Activity & Infertile

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### **INTRODUCTION**

The Biochemical analysis of the seminal fluid would provide valuable information regarding the function of accessory sex glands. Acid phosphatase and Alkaline phosphatases are specific enzymes which catalyze the hydrolysis of various phosphate esters bond. Bovedek and Glover, 1970, described the role of phosphatase in the metabolism related to the maturation of sperm in the epididymis.

Acid phosphatase activity in human has a diagnostic value not only in prostate's function (Singer R, 1979) but also in forensic medicine when it is necessary to prove the presence of semen (Enos WF, 1980). A decrease in seminal acid phosphatase level may be an indication of impaired androgen activity in men. Mann, (1964), Mann- Lutwak, (1981) and Schinder, (1967) indicate a relation between the level of acid phosphatase in semen and the androgenic activity. Earlier Homolka, (1961) reported a significantly lower level of acid phosphatase in the mean with disturbances of reproductive development.

Alkaline phosphatase is secreted by the prostate gland and testis. Alkaline phosphatase causes loss of the phosphorous group, which is effective in several tissues. Several studies demonstrated a correlation between enzyme activities and semen concentration and fertility.

The quality, quantity and biochemical composition of human semen have been studied from the various diagnostic points of view such as in the diagnosis of prostate, infertility, and cancer (Owen & Katz, 2005. Eliasson,

1982). Recently Sidhu and Guraya (1985) reported its role in the regulation of sperm physiology. Seminal fluid biochemical traits influence the success of male reproductive process to a large extent (Pefrunkina et al, 2007).

Frequently use of mobile phone appears to be one of the major's dangerous sources of electromagnetic radiation (Salford et al, 2001). A recent report by TRAI, as on dated 30th September 2018, the overall telecom subscriber base has reached 1191.40 million populations in India. Earlier findings of Verma and Traboulary (1975); Saunders and Kowalczyk (1981) and Gasinska and Hills (1990) indicated that mobile phone frequency radiation adversely affects that process of reproduction and reproductive organs. But a little information is available regarding the biological attributes of seminal fluid of human subjects using a mobile phone for the variable durations.

Therefore the present work has been undertaken with an aim to explore the extent of the adverse effect of different duration usage of the mobile phone on some biochemical constituents of seminal fluid of users and non- users human subjects.

## MATERIALS AND METHODS

In the present proposed investigation 273 human subjects (110 never used mobile phones and 163 mobile phone users) of 19-45 years of age group were employed. Subjects using mobile and keep it in their waist pocket were categorized into the following groups and the subjects who never used mobile phone were regarded as control normal.

- Group 1- Normal/control.
- Group 2- Using the mobile phone since 01-05 years of duration.
- Group 3- Using the mobile phone since 06-09 years of duration.
- Group 4 - > 10 years of duration.

Semen from all categories of human subjects was collected and seminal plasma was separated through centrifugation. Acid phosphatase activity was assayed at 37 °C with 5.5 mmol/liter p-nitrophenyl phosphate (Boehringer Mannheim) as a substrate in citrate buffer (50 mmol/liter, pH 4.8). After an incubation of 15 min, the reaction was stopped by adding 2 ml of a 0.02 mol/liter solution of NaOH, and the amount of p-nitrophenol liberated was measured at 400 nm. Alkaline phosphatase activity was measured by the method of the kind & king (1954) with the help of kit supplied by san diagnostics Ltd. (India).

## RESULTS & DISCUSSIONS

As indicated in Table 1, a highly significant decreased activity of acid phosphatase enzyme was observed in different duration mobile phone users in comparison to non-users human subjects. A highly significant ( $p < 0.01$ ) decreased activity in human subjects using mobile phones from 06-09 years duration in comparison to non-users of human subjects. This decreased activity was highly significant ( $p < 0.001$ ) in human subjects who were using mobile phones from 10 years or more than 10 years of duration in comparison to non- users human subjects.

As indicated in Table 1, a highly significant increased alkaline phosphatase enzyme activity in seminal fluid of human subjects using different duration mobile phone. A highly significant ( $p < 0.01$ ) increased activity in human subjects using mobile phones from 01-05 years duration, and a highly significant ( $p < 0.001$ ) increased alkaline phosphatase enzyme activity in human subjects from 10 years or more than 10 years of duration in comparison to non- users human subjects

were observed.

**Table 1: Level of Different Biochemical Parameters in Normal and Different Duration Use of Mobile Phone in Human Subjects**

Serial Number	Mobile Phone Users (in years)	Level of Different Biochemical Constituents of Semen (Mean $\pm$ SE of Samples)	
		Acid Phosphatase Activity (in KA Units)	Alkaline Phosphatase Activity (in KA Units)
1.	Non- users <sup>a</sup> (110)	4.01 $\pm$ 0.23	1.92 $\pm$ 0.171
2.	0-05 <sup>b</sup> (65)	3.94 $\pm$ 0.76	2.53 $\pm$ 0.411
3.	06-09 <sup>c</sup> (45)	3.08 $\pm$ 0.13	2.78 $\pm$ 0.101
4.	>10 <sup>d</sup> (53)	2.87 $\pm$ 0.19	2.81 $\pm$ 0.132

(Number in parenthesis indicates the number of samples)

#### P- Value

- Acid phosphatase- a to c =  $p < 0.01$ , a to d =  $p < 0.001$
- Alkaline Phosphatase- a to b =  $p < 0.01$ ; a to c =  $p < 0.001$ , a to d =  $p < 0.001$ .

Grissom (1995) and Kula and Drozd (1994), reported that biological effect of mobile phone frequency induced oxidative stress and cause protein oxidation, enzyme activation and lipid peroxidation within the cellular membrane resulting in structural and functional abnormalities. An earlier report of Sarookhani et al., (2011) also indicated that exposed 950 MHz mobile phone radiation showed decreased the level of testosterone, might be responsible for deteriorating the function of prostate gland, which is responsible for the decreased level of acid phosphatase level in the semen. Due to such biochemical effect the decreased acid phosphatase activity in seminal fluid possible as per our findings of the work in long duration (more than 6-10 years mobile phone) user human subjects.

But a highly significant increased level of alkaline phosphatase activity in seminal fluid of mobile phone users in comparison to non-users/ normal might be possible due to structural deformities in spermatozoa membrane caused by mobile phone radiofrequency exposure, Ozguner et al. (2005) and Forgacs et al. (2006). As earlier findings of Sidhu & Garaya, (1985) indicated that acrosome, post-nuclear cap, and midpiece contain alkaline phosphatase enzymes and possibly when it ruptures due to oxidative stress, it leaks out in seminal fluid and thus increased alkaline phosphatase activity might observe in our findings.

#### CONCLUSIONS

Radiofrequency radiation may have a harmful effect on human semen quality. As for human studies, although the defined effect of mobile phone radiation on semen quality cannot be concluded from the existing studies, men should not keep the mobile phone in their trouser pockets or near testicles to avoid the potentially harmful effect of radiofrequency radiation on the male reproductive system. Further, well designed and standardized case-control and cohort studies are needed to identify the effect of mobile phone use on semen quality and the association between mobile phone use and infertility.

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